

REMARKS

This responds to the Office Action mailed on September 20, 2006.

Claims 1 and 27 are amended; no claims are canceled; and no claims are added. As a result, claims 1-10, 27-30, and 32-35 are now pending in this application, with claims 8-9 and 28-29 being withdrawn.

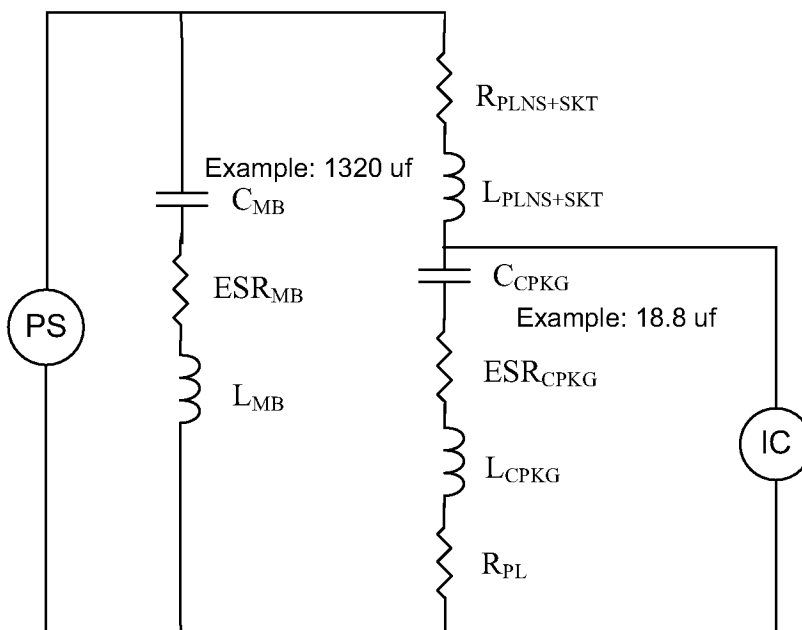
Interview Summary

Applicant thanks Examiner Tuan Dinh for the courtesy of a telephone interview on November 20, 2006 with Applicant's representative Bruce Houston. Mr. Houston remarked that the invention, including claim 1, is physical in nature but is rejected using a reference (prior art FIG. 1) that is a theoretical model. The theoretical model of Application FIG. 2 does not capture all important physical attributes of the invention, including elements shown in FIGS. 3-7. Examiner Dinh then explained that he has trouble understanding how adding a few milliohms of resistance (R_{PL}) to the circuit could result in a patentable difference in circuit operation as compared to PA FIG. 1. According to Examiner Dinh, "[i]f you add a resistance value to change the circuit from 5 ohms to 5.00000001 ohms, the circuit value [as a whole] is not changed." Examiner Dinh stated that he spoke with superiors about the circuit, and that various Patent Office personnel agreed that it was unlikely that adding such a small resistance could render the circuit of FIG. 2 patentably distinct from FIG. 1. Examiner Dinh therefore rejected claim 1 as unpatentable over FIG. 1 based upon 35 U.S.C. 103(a). Mr. Houston agreed to respond to Examiner Dinh's concern with examples and explanations in light of Applicants' specification showing how changing the circuit electrically and physically using the resistive material of claim 1 results in a useful and non-obvious advancement.

Explanations and Examples in Light of the Specification

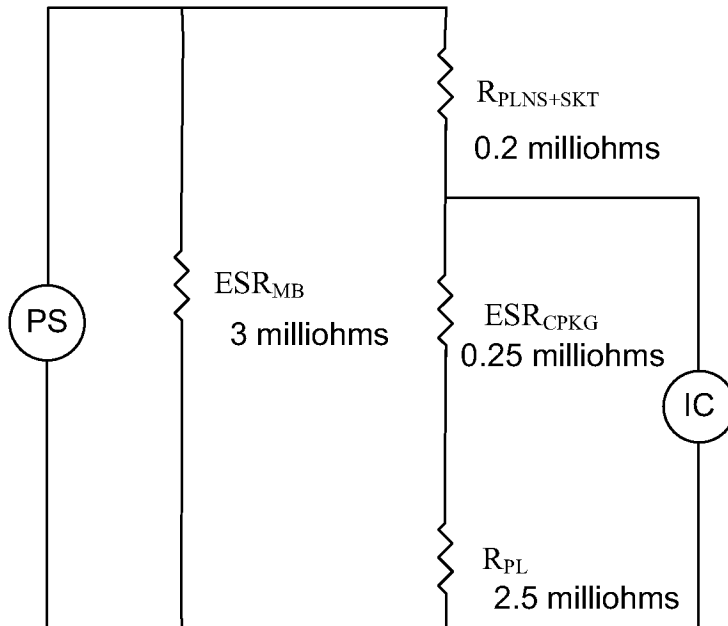
Claim 1 as amended contains physical and electrical limitations associated with a resistive element very closely coupled to an integrated circuit (IC) bypass capacitor. The value of the invented resistive element is precisely defined in terms of other resistances in a resistive network comprising equivalent resistances of circuit components electrically and physically proximate to the invented resistive element. The resistive network of Application FIG. 2 is

redrawn here below to assist the Examiner with understanding (a) how the invented resistive element is related to the equivalent circuit resistances; and (b) why the invented resistance value is substantial and useful relative to the equivalent circuit resistances. It is noted that any values indicated for any circuit elements are exemplary and not intended to limit the scope of the invention or of its equivalents. Typical values of 1320 uf and 18.8 uf for the power supply decoupling capacitor C_{MB} and the IC bypass capacitor C_{CPKG} , respectively, are shown in the redrawn FIG. 2, below.



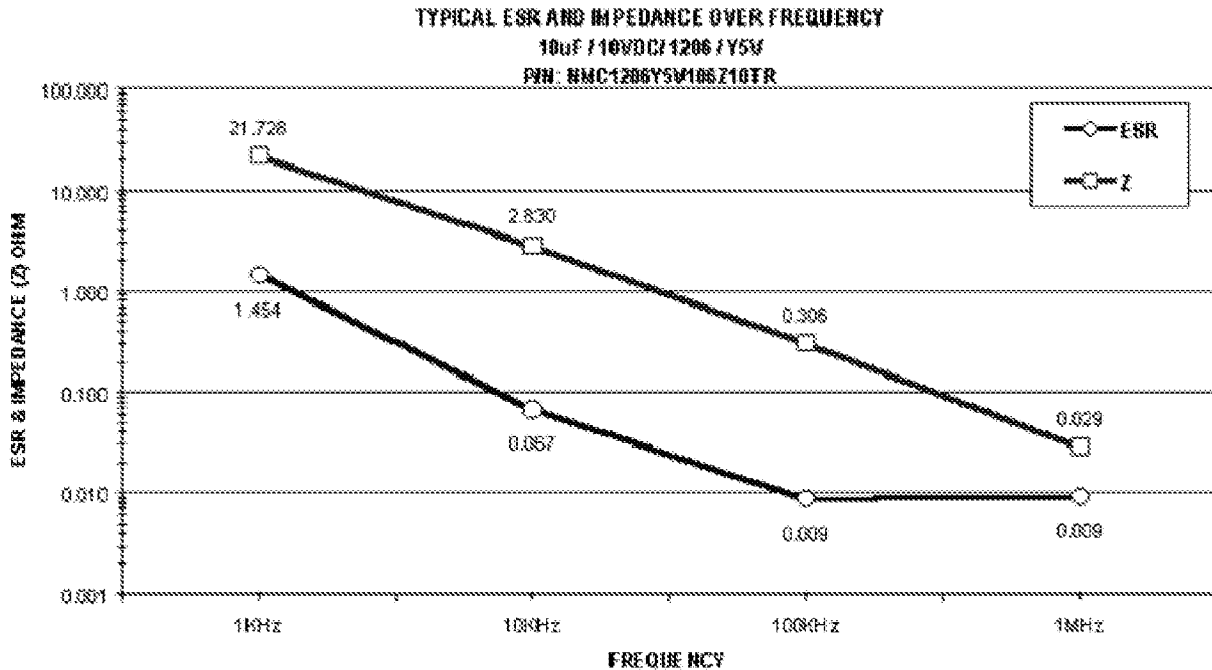
This parallel circuit and its components, less the invented resistance R_{PL} , is described in Applicants' Specification beginning at pg. 1, line 26.

At resonance, the impedances associated with the capacitive and inductive equivalents for each of the two capacitors cancel and the circuit collapses to the figure shown below.

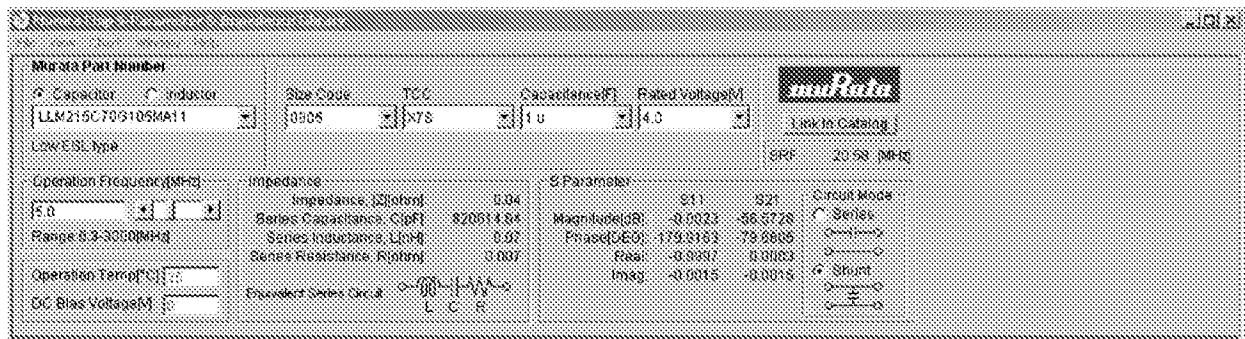


Applicants' specification teaches that ringing artifacts are reduced when the summed series resistance $R_{PL} + ESR_{CPKG} + R_{PLNS+SKT}$ is approximately equal to the effective series resistance (ESR) of ESR_{MB} . Applicants' claims 1 and 27 claim a particular physical structure to implement Applicants' invented resistance R_{PL} . Significantly, Applicants have designed the physical structure of R_{PL} and its coupling to the IC bypass capacitor C_{CPKG} such as to minimize additional inductance associated with connections between R_{PL} and C_{CPKG} . These structures are shown in detail in Applicants' FIGS. 3-7. An electrical equivalent schematic is not adequate to show such physical structures. Therefore, any such schematic necessarily omits these claim elements.

The figure above also shows typical equivalent circuit resistances for the equivalent circuit components. Effective series resistances (ESRs) for capacitors at resonance may be characterized and are typically published by capacitor manufacturers, as shown in the following example for NIC Components Corporation, extracted from an online reference found at <http://www.low-esr.com/esrfreqperfcures.html-ssi>.



From the chart above it can be seen that the ESR for this particular model of 10 uf capacitor is about 9-10 milliohms. Similarly, the capacitor manufacturer Murata documents ESR values for its line of capacitors in a database access tool called the “Murata Chip S-Parameter and Impedance Library,” available at <http://murata.com/designlib/index.html>. The example screenshot below displays an ESR of 7 milliohms at 5 MHz for a 1 uf capacitor of the model selected.



Likewise, the circuit and ground plane resistances ($R_{PLNS+SKT}$) associated with the paths described in Applicants’ Specification and claimed in Applicants’ claims are determinant from

circuit simulations and physical measurements, and are on the order of milliohms or tenths of milliohms. Thus, $R_{PL} = ESR_{MB} - ESR_{CPKG} - R_{PLNS+SKT}$ is determinant. Precision attaches to a determination of R_{PL} by virtue of the equation's containing four variables, values for three of which are known. If R_{PL} is set to a value that is not *exactly* equal to $ESR_{MB} - ESR_{CPKG} - R_{PLNS+SKT}$, the invention does not stop working. In the latter case, power pin ringing may simply not be optimally reduced.

Thus, the answer to Examiners query as to how an R_{PL} of a few milliohms could be significant is a consequence of the milliohm values of the associated equivalent circuit resistances. For together, Kirchhoff's law and Ohm's law teach that the significance of a resistance value in a series-parallel network lies not in the absolute value of the resistance but rather in the *ratio* of the resistance value to other resistance values in the network. Applicants' invented embodiments relate to components in very close physical proximity to one another at a pad or at an IC socket (e.g., a microprocessor socket). Thus, the resistance values are small; the parasitic inductances are important; and the effects of mismatches are large.

§103 Rejection of the Claims

Claims 1, 2 and 27 were rejected under 35 USC § 103(a) as being unpatentable over "Prior Art" (FIG. 1 submitted by Applicant, hereinafter "PA"). Claims 3-7, 10, 30 and 32-35 were also rejected under 35 USC § 103(a) as being unpatentable over PA in view of Nagasaka (U.S. 6,201,286). Applicants do not admit that Nagasaka is prior art, and reserve the right to swear behind this reference in the future.

The Office bears the burden under 35 U.S.C. § 103 of establishing a *prima facie* case of obviousness. *In re Fine*, 837 F.2d 1071, 1074, 5 U.S.P.Q.2d (BNA) 1596, 1598 (Fed. Cir. 1988). The M.P.E.P. directs the Examiner in accordance with the *In re Fine* court:

In order for the Examiner to establish a *prima facie* case of obviousness, three base criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure.

M.P.E.P. § 2142 (citing *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d (BNA) 1438 (Fed. Cir. 1991)).

The requirement of a suggestion or motivation to combine references in a *prima facie* case of obviousness is emphasized in the Federal Circuit opinion, *In re Sang Su Lee*, 277 F.3d 1338, 61 U.S.P.Q.2D 1430 (Fed. Cir. 2002), which indicates that the motivation must be supported by evidence in the record.

Applicants' claim 1, rejected under 35 U.S.C. § 103(a) using PA FIG. 1 as a single reference, as amended, reads:

A resistive element, comprising:

a first contact point connected to a ground terminal of an integrated circuit bypass capacitor;

a second contact point connected to a circuit board ground plane; and

a resistive material connected to the first and second contact points, wherein a summed series resistance obtained by adding a value of resistance of the resistive element, a value of an effective series resistance of the bypass capacitor including the bypass capacitor terminal, a value of an equivalent circuit resistance between a power supply voltage terminal of the bypass capacitor and a power supply voltage terminal of a power supply decoupling capacitor located nearest to the bypass capacitor, and a value of an effective resistance between the second contact point and a ground terminal of the power supply decoupling capacitor is approximately equal to an effective series resistance of the power supply decoupling capacitor.

A table of Applicants' claim elements is shown immediately below, with an indication for each claim element whether the claim element is capable of being represented as an electromagnetic property on a schematic diagram, or whether the claim element has at least one physical, non-electromagnetic dimension and is therefore incapable of complete representation as an electrical quantity on an electrical schematic diagram.

<u>CLAIM ELEMENT</u>	<u>SCHEMATIC</u>	<u>PHYSICAL</u>
resistive element	Yes	
first contact point	No	Yes
ground terminal	Yes	Yes
IC bypass capacitor	Yes	
second contact point	No	Yes
circuit board ground plane	No	Yes
resistive material	No	Yes
value of resistive element	Yes	

IC bypass capacitor ESR	Yes	
IC bypass capacitor PS terminal	No	Yes
resistance of IC bypass cap terminal	Yes	
resistance between IC bypass & decoupling capacitors	Yes	
decoupling capacitor	Yes	
decoupling cap. PS terminal	No	Yes
decoupling cap. ground terminal	No	Yes
decoupling cap. ESR	Yes	

Applicants' claim 2 includes these additional elements:

solder at junction of first contact point and bypass cap. term.	No	Yes
at least one via	No	Yes

Applicants' claim 27 contains similar claim elements. PA FIG. 1 does not contain all of Applicants' claim elements, as listed above. As an electrical schematic diagram, PA FIG. 1 is incapable of showing the physical, non-electromagnetic attributes of certain of Applicants' claim elements as listed above. Therefore, PA FIG. 1 is not alone effective to show obviousness as to Applicants' claims 1-2 and 27. But even if PA FIG. 1 *were* capable of use as a single-art 35 U.S.C. § 103(a) reference as to Applicants' claims 1-2 and 27 (and Applicants do not admit that it is, as herein described), the Office has not presented a *prima facie* case of obviousness. Such a showing would require that, for each claim element as listed above, the Office point out a corresponding element on PA FIG. 1, as required by *M.P.E.P.* § 2142. The Office has not done so. Claims 1-2 and 27 are thought to be non-obvious over PA FIG. 1 for at least these reasons.

Discussing claim 2, for example, the Office asserts that "[a]s to claim 2, PA discloses the first contact point being connected to the capacitor terminal by solder and the second contact point being electrically connected to the plane by via." Office Action pg. 3, line 3. PA FIG. 1 does not disclose solder or vias, of course, because solder and vias are mechanical elements. PA FIG. 1 is an *electrical schematic diagram* showing idealized electrical properties. PA FIG. 1 is not a mechanical figure. Claim 2 is thought to be non-obvious over PA FIG. 1 for at least these reasons.

The Office admits that PA FIG. 1 does not teach the value of the resistive element R_{PL} . However the Office asserts that "[i]t would have been obvious to one having ordinary skill in the

art at the time the invention was made to replace the resistive element for increasing an impedance by the replacement resistor as taught by PA in order to form an equivalent circuit and control a frequency applied on a circuit board or device.” Office Action, pg. 2, bottom paragraph. It is unclear what is meant by “replac[ing] the resistive element for increasing an impedance by the replacement resistor.” PA FIG. 1 shows no such “replacement resistor.”

On the one hand, during the above-documented Examiner Interview, the Office declared that an R_{PL} of a few milliohms could not be effective in making a difference in the equivalent circuit of FIG. 2. On the other hand, in the instant Office Action, the Office appears to assert that the introduction of R_{PL} into the circuit, determining the value of R_{PL} , and the effectiveness of R_{PL} for purposes of the invention “would have been obvious to one having ordinary skill in the art at the time the invention was made.” Thus, the Office appears to be using Examiner’s personal knowledge and/or hindsight to read Applicants’ claim elements into the reference PA FIG. 1. Accordingly, Applicants respectfully request an affidavit as authorized under 37 C.F.R. § 1.104(d)(2). Applicants’ claims 1-2 and 27 are thought to be non-obvious over PA FIG. 1 for at least these reasons.

As to claims 3-7, 10, 30, and 32-35, the Office suggests a combination of PA FIG. 1 and Nagasaka. Applicants do not admit that Nagasaka is analogous art or that the Office has satisfied its burden of showing a motivation to combine Nagasaka and PA FIG. 1 to obtain Applicants’ claim elements. But even if combinable, no combination of PA FIG. 1 and Nagasaka teach all of Applicants’ claim elements. PA FIG. 1 does not show a resistive material at all. Nagasaka does not show a resistive material fashioned in the same way as Applicants’ invention. Specifically, Nagasaka does not show “a resistive material connected to the first and second contact points,” wherein the contact points are as described in Applicants’ independent claims 1 and 27 and as defined in Applicants’ Specification. Neither does Nagasaka disclose a resistive material configured to reduce ringing on an IC power pin.

As to claims 3-6 and 32-35, the Office admits that “PA does not specific [sic] disclose the resistive material having the first and second metal, which are nickel and gold.” Office Action, pg. 3, Item 3. Applicants reiterate that as an electrical schematic diagram, PA FIG. 1 does not and cannot disclose a “resistive material” or any other “material.” The latter relate to physical and/or chemical properties and not to electromagnetic properties capable of representation on an

electrical schematic diagram. Such “resistive material” certainly is not shown on PA FIG. 1. Claims 3-6 and 32-35 are thought to be non-obvious over PA in view of Nagasaka for at least these reasons.

According to the Office, “Nagasaka discloses the resistive material (12) includes first and second metals (column 4, lines 10-11), the first metal is nickel and the second metal is gold, see column 4, lines 30-31.” Office Action, pg. 3, para. 3. However, Nagasaka actually says, “Further, surface conductive patterns 17 are formed on the insulating layer 14. If necessary, the surface conductive patterns 17 may be plated with copper, nickel, or gold.” Nagasaka col. 4, lines 28-31. Thus, the Office appears to confuse surface conductive patterns with Applicants’ resistive material. These references to Nagasaka are thus not effective; and claims 3-6 and 32-35 are thought to be non-obvious for at least these reasons.

It is unclear what the Office means by “[i]t would have been obvious to one having ordinary skill in the art at the time the invention was made to have a teaching of Nagasaka employed the material of resistive element of PA in order to achieve excellent conductivity.” Office Action, pg. 3, para. 5. PA FIG. 1 contains no “resistive material,” as previously described. Even if it did, employing a resistive material to “achieve excellent conductivity” appears nonsensical, because resistance and conductivity are at opposite ends of a continuum. Thus, this portion of the Office Action is unclear and Applicants respectfully request that a subsequent Office Action rejecting any of Applicants’ claims 3-6 and 32-35 not be made final before providing a reasonable explanation for this ground of rejection. An affidavit as authorized under 37 C.F.R. § 1.104(d)(2) is also respectfully requested. Claims 3-6 and 32-35 are thought to be non-obvious for at least these reasons.

Regarding claim 7, the Office states that “PA and Nagasaka do not specific [sic] disclose the particular dimensions of the first and second metals have a width of about 10 to about 1000 microns, a length of about 10 to about 5000 microns, and a total thickness of about 0.05 to about 2.5 microns. However, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to have a dimension of the resistive element in order to reduce sized [sic] and thickness for a miniature device.” Office Action, pg. 3, bottom paragraph. Applicants’ claimed dimensions are related to adding resistance to an IC bypass capacitor while minimizing stray inductance that might otherwise be introduced thereby. These dimensions are

not related to device miniaturization generally. This statement by the Office thus suggests that the Office may have used mistaken hindsight based upon personal knowledge in the rejection of claim 7. An affidavit as authorized under 37 C.F.R. § 1.104(d)(2) is therefore respectfully requested. Claim 7 is thought to be non-obvious for at least these reasons.

Claims depending from a non-obvious claim are themselves non-obvious. Claims 2-7 and 10 depend from claim 1, the latter thought to be non-obvious over PA FIG. 1 as previously described. Claims 30 and 32-35 depend from claim 27, the latter thought to be non-obvious over PA FIG. 1 as previously described. Claims 1-7, 10, 27, and 32-35 are thought to be non-obvious and allowable for at least these reasons. Withdrawal of these rejections and notification of allowance are therefore earnestly requested as to claims 1-7, 10, 27, and 32-35.

Conclusion

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney at (210) 892-0437 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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